

CLAIMS

1. A polytrimethylene terephthalate resin comprising:
60 to 100 mole % of (a) trimethylene terephthalate
5 recurring units, and

0 to 40 mole % of (b) at least one monomer unit
selected from the group consisting of monomer units ob-
tained from comonomers which are other than the mono-
mers used for forming said trimethylene terephthalate
10 recurring units and which are copolymerizable with at
least one of the monomers used for forming said
trimethylene terephthalate recurring units,

the total molar amount of (a) monomer units and
(b) monomer units being 100 mole %,

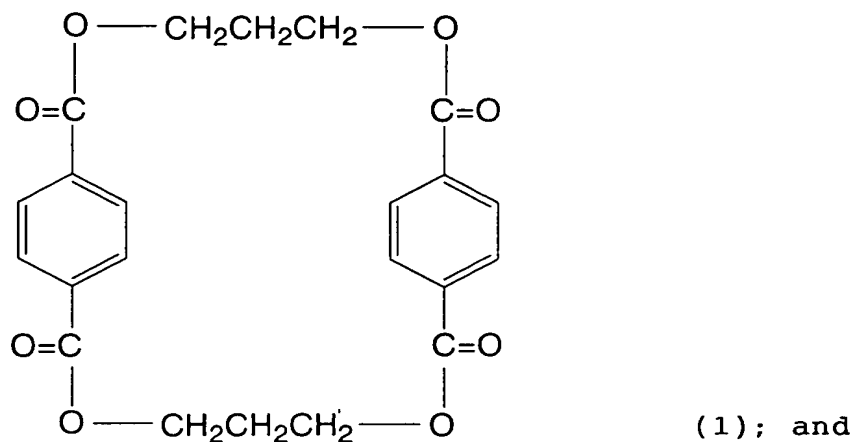
15 said polytrimethylene terephthalate resin having
the following characteristics (A) to (D):

(A) an intrinsic viscosity $[\eta]$ of from 0.6 to 4
dl/g;

(B) a molecular weight distribution of from 2 to
20 2.7 in terms of the M_w/M_n ratio, wherein M_w represents
the weight average molecular weight of said poly-
trimethylene terephthalate resin and M_n represents the
number average molecular weight of said polytrimethyl-
ene terephthalate resin;

25 (C) a cyclic dimer content of not greater than 2 %

by weight, said cyclic dimer being represented by the following formula (1):



(D) a psychometric lightness L-value of from 70 to
5 100 and a psychometric chroma b*-value of from -5 to 25.

2. The polytrimethylene terephthalate resin according to claim 1, which is in the form of pellets,

said pellets having a crystallinity (X_c) of 40 %
10 or less, wherein said crystallinity (X_c) is defined by the following formula (2):

$$X_c (\%) = \frac{\{\rho_c \times (\rho_s - \rho_a)\}}{\{\rho_s \times (\rho_c - \rho_a)\}} \times 100 \quad (2)$$

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wherein ρ_a is 1.300 g/cm³ which is an amorphous density of trimethylene terephthalate

homopolymer, ρ_c is 1.431 g/cm³ which is a crystal density of trimethylene terephthalate homopolymer, and ρ_s represents a density (g/cm³) of said pellets.

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3. A method for producing the polytrimethylene terephthalate resin of claim 1 or 2, which comprises:

(1) providing a crude trimethylene terephthalate resin in a molten form, said crude trimethylene terephthalate resin comprising:

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60 to 100 mole % of (a) trimethylene terephthalate recurring units, and

0 to 40 mole % of (b) at least one monomer unit selected from the group consisting of monomer units obtained from comonomers which are other than the monomers used for forming said trimethylene terephthalate recurring units and which are copolymerizable with at least one of the monomers used for forming said trimethylene terephthalate recurring units,

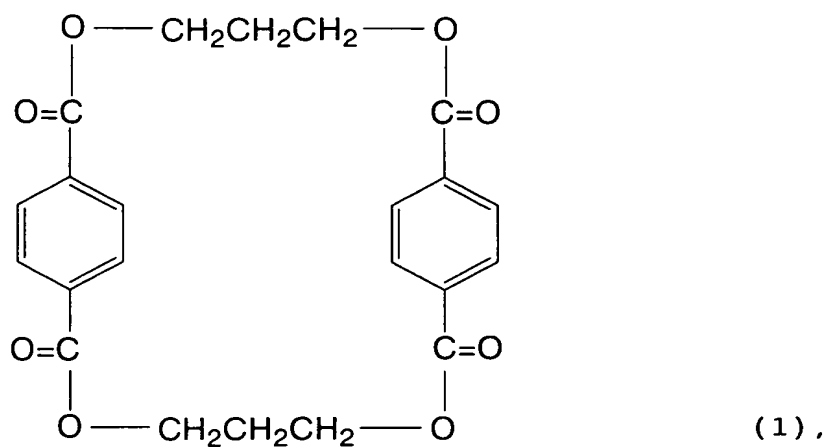
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the total molar amount of (a) monomer units and (b) monomer units being 100 mole %,

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said crude trimethylene terephthalate resin further comprising a cyclic dimer represented by the following formula (1):

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said crude trimethylene terephthalate resin having
 an intrinsic viscosity $[\eta]$ of from 0.2 to 4 dl/g and a
 5 cyclic dimer formation index (E) of less than 0.066,
 said cyclic dimer formation index (E) being defined by
 the following formula (3):

$$E = W/M$$

10 (3)

wherein M represents the terminal hydroxyl
 group content of said crude trimethylene
 terephthalate resin in terms of mole % based
 15 on the total molar amount of the trimethyl-
 ene terephthalate unit, and W represents the
 re-formation rate of the cyclic dimer in
 terms of an increase (as expressed by abso-

- lute percentage value) in the cyclic dimer content (% by weight), per minute, of the crude trimethylene terephthalate resin as measured at 260 °C in nitrogen gas atmosphere with respect to a sample of the crude polytrimethylene terephthalate resin in a molten form, wherein the molten sample is obtained by melting a cyclic dimer-reduced sample of the crude polytrimethylene terephthalate resin which cyclic dimer-reduced sample has a cyclic dimer content reduced to 0.1 % by weight or less; and
- (2) removing, from said crude polytrimethylene terephthalate resin in a molten form, 0.5 % by weight or more, based on the weight of said crude polytrimethylene terephthalate resin, of said cyclic dimer, by volatilization under reduced pressure.
4. The method according to claim 3, wherein said crude polytrimethylene terephthalate resin has a cyclic dimer formation index (E) of less than 0.033.
5. The method according to claim 3 or 4, wherein said crude trimethylene terephthalate resin in a molten form provided in said step (1) has an intrinsic viscosity

[η] of from 0.2 to 2 dl/g, and the removal of said cyclic dimer in said step (2) is performed by a method comprising continuously feeding said crude trimethylene terephthalate resin in a molten form to a guide-wetting fall polymerizer having a perforated plate and at least one guide provided in association with the perforated plate, wherein said crude trimethylene terephthalate resin is allowed to fall along and in contact with the surface of said at least one guide provided in the polymerizer at a temperature which is equal to or higher than the crystalline melting point of said crude trimethylene terephthalate resin and is not higher than 290 °C under reduced pressure, so that polymerization of said crude trimethylene terephthalate resin and volatilization of said cyclic dimer are effected during the fall of said crude trimethylene terephthalate resin, while continuously withdrawing the resultant trimethylene terephthalate resin from said polymerizer.

6. The method according to claim 3 or 4, wherein said crude trimethylene terephthalate resin in a molten form provided in said step (1) has an intrinsic viscosity [η] of from 0.6 to 4 dl/g, and the removal of said cyclic dimer in said step (2) is performed by means of a thin film evaporator under conditions wherein:

(a) the pressure in said thin film evaporator is a reduced pressure of 2.6 kPa or less,

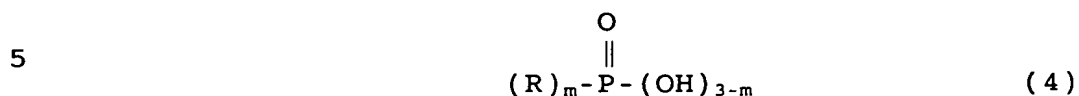
(b) a thin film of the crude polytrimethylene terephthalate resin in a molten form is formed on the inner wall of said thin film evaporator, while performing the surface renewal of said crude polytrimethylene terephthalate resin,

(c) said thin film of the crude polytrimethylene terephthalate resin in a molten form has a resin-gas contact area of $1 \text{ cm}^2/\text{g}$ or more, in terms of a value calculated by dividing the area of said crude polytrimethylene terephthalate resin which is in contact with the gaseous phase inside the thin film evaporator by the weight of the crude polytrimethylene terephthalate resin present in said thin film evaporator, and

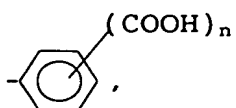
(d) said crude polytrimethylene terephthalate resin occupies not more than 40 % of the inner space of said thin film evaporator.

7. The method according to any one of claims 3 to 6, wherein said crude trimethylene terephthalate resin is produced by a polycondensation reaction performed in the presence of a catalyst comprising at least one titanium compound and at least one phosphorus compound selected from the group consisting of phosphoric acid,

a phosphoric ester, phosphorous acid, a phosphorous ester and a phosphorus compound represented by the following formula (4):



wherein m is an integer of 1 or 2, and

each R independently represents ,

10 wherein n is an integer of from 0 to 3,
 wherein said at least one titanium compound and said at least one phosphorus compound are used in respective amounts such that the phosphorus/titanium atomic ratio is in the range of from 0.01 to 10.

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8. The method according to any one of claims 3 to 7, wherein said crude trimethylene terephthalate resin is produced by a polycondensation reaction performed in the presence of a catalyst comprising at least one tin
 20 compound having no carbon-tin bond.